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MEMORANDUM

DATE **April 19, 2012**

TO **Boston Region Metropolitan Planning Organization**

FROM **Mark Abbott**

RE **Arterial Traffic Signal Improvements and Coordination Study: Braintree**

BACKGROUND

This study was recommended by the Boston Region MPO's Congestion Management Process and was funded by the MPO in the federal fiscal year (FFY) 2010 Unified Planning Work Program.

Traffic signal coordination or synchronization promotes efficient traffic flow along an arterial roadway. Typically, arterial flow quality and efficiency is dictated by the level of service at traffic signals and the degree of coordination between them. Generally traffic flow can be improved by coordination when the signals are located within one-quarter of a mile of each other. Where traffic signals are coordinated, traffic moves in platoons along the road and, at certain speeds, can proceed through intersections without braking or stopping. In coordination, side street traffic and pedestrians must be considered, so that their needs for service through the coordinated intersections are met. A side benefit of coordination is enhanced safety through more efficient management and operation of the arterial signal systems.

The study's overall purpose was to evaluate three or four groups of arterial signalized intersections, consisting of two to three intersections each, throughout the region and to develop recommendations for improvements. The improvements were focused primarily on traffic signal coordination aimed at improving traffic flow and safety along the arterials. As part of the traffic signal coordination strategy, staff also considered geometric improvements and traffic signal design changes at the selected locations.

The process for selecting the groups of intersections for this study began with identifying traffic signals at intersections that are a quarter mile or less apart and that were included in the "Conceptual" or the "Pre-TIP" project category in the FFYs 2009–11 Transportation Improvement Program (TIP). Each location's crash history was also examined. In addition, staff asked MassDOT's Highway Division District 4 to suggest locations that they thought would be appropriate. A table showing the resultant universe of potential signal coordination locations is provided as Appendix A; correspondence with the District 4 traffic engineer is

provided as Appendix B. The locations were then examined to verify from a technical standpoint that signal coordination could potentially be implemented at them.

The final four groups of intersections selected by staff and District 4 through this process were then discussed with the MassDOT District 4 traffic engineer and the towns where the intersections are located. The final four signal groupings selected for this study were:

- *Braintree*
  Washington Street at Common Street/President Road; at Route 3 southbound off-ramp; and at Independence Avenue/Church Street

- *Lexington/Bedford*
  Route 4/225 at Hartwell Avenue; at Shawsheen Road; and at Great Road Shopping Center

- *Randolph*
  Route 28 (as North Main Street) at Warren Street; at Memorial Parkway; and (as South Main Street) at North and Union streets

- *Weymouth*
  Route 53 at Mutton Lane and at Pleasant Street

This memorandum provides information, analysis, and recommendations for the intersections located in Braintree. Separate memoranda are provided for each of the signal groupings.

OVERVIEW OF THE STUDY AREA

The three Washington Street intersections chosen in Braintree (listed above) are shown in Figure 1. These intersections are currently signalized and located along 0.19 miles (1,020 feet) of the street. Common Street/President Road and Route 3 southbound off-ramp are 520 feet apart; Route 3 southbound off-ramp and Independence Avenue/Church Street are 500 feet apart.

Located between the Route 3 off-ramp and Independence Avenue/Church Street intersections are two bridge structures. The first is approximately 180 feet in length and carries Washington Street over Route 3. The second structure is approximately 100 feet in length and spans the Old Colony and Middleborough commuter rail tracks. Between the two bridge structures there is a short section (±75 feet) of retained fill.

On-street parking is not permitted along either side of Washington Street from the Common Street/President Road intersection to the Independence Avenue/Church Street intersection. Sidewalks are present on the eastern side of Washington along the full length of the study area, along both sides of Common Street, and only on the northern side of President Road.

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FIGURE 1
Study Area Intersections

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Arterial Traffic Signal Improvements and Coordination: Braintree

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Washington Street and Independence Avenue are both classified as urban principal arterials. Washington Street north of the Independence Avenue/Church Street intersection is an urban collector. The Route 3 off-ramp to Washington Street is also classified as an urban principal arterial. Common Street and Church Street are classified as urban minor arterials, and President Road is a local road.

OBJECTIVES OF THE STUDY

The objectives for the locations in Braintree were to verify if signal coordination would, in fact, improve traffic operations and to identify other possible improvements that would reduce delays and enhance safety. Two of the three intersections provide either access to or egress from Route 3, the main commuter roadway to Boston from South Shore communities. Coordination at these intersections could ease congestion, although it may not provide a maximized progression in either direction.

EXISTING CONDITIONS

Note: Traffic volume data and crash analyses are provided in separate sections that follow.

Washington Street at Common Street/President Road

Layout

This is a four-way intersection, with Washington Street running north/south. The Washington Street approaches to the intersection consist of two general-purpose lanes, with two departure lanes in the southbound direction and the northbound departure opening up to three lanes. Common Street (eastbound approach) and President Road (westbound approach) are offset approximately 50 feet from each other, with President Road north of Common Street. Common Street is one lane that opens to two lanes approximately 80 feet from the intersection. This widening allows for exclusive left- and right-turn lanes. There is a small median island that divides the approach and departure lanes at the intersection. President Road is one lane. Located on Common Street approximately 100 feet west of the intersection is Staten Road.

Crosswalks are provided across all four approaches of the intersection. Sidewalks are present along both sides of Washington Street south of the intersection, but only on the east side of Washington Street north of the intersection. Though there are crosswalks that lead to and from the northwest corner of the intersection, the sidewalk ends at the corner and does not continue north along Washington Street. Common Street and President Road have sidewalks along both sides of the street.

Land Use

The buildings adjacent to the intersection are mainly residences. One commercial business, Braintree Auto Works, is located on the northeast corner of the intersection. On the northwest corner and continuing north are homes, which abut Washington Street; however, access is

provided from Cavanaugh Road, which connects to Common Street. The southeast and southwest corners also have homes. Abutting the home on the southeast corner, along Washington Street, is a Seventh Day Adventist Church. President Road has homes along both sides of the street.

Signal System

The intersection has a fully actuated signal system with loop detectors provided on all approaches. It is designed as a three-phase signal operation, with an exclusive pedestrian phase provided upon pedestrian actuation. The northbound Washington Street approach is controlled by a lead protected/permitted phase to accommodate northbound left-turning vehicles. An exclusive pedestrian phase, when actuated, follows the northbound and southbound phases. The Common Street and President Road movements are the final phase. The cycle length of the intersection is 148 seconds, including a 32-second pedestrian phase.

The signal heads are mounted on mast arms and on posts. The mast arms are located on the northwest, southwest, and southeast corners of the intersection. Signal posts are also located opposite the Common Street and President Road approaches. All signal heads are standard three-section, 12-inch heads except for the signal head located over the left lane northbound approach, which has a 4-section head to accommodate the protected/permitted left-turn movement. Pedestrian signals and push buttons are provided for all crosswalk movements.

Observations of Operation

Peak-hour observations of the intersection indicate that generally the intersection operates acceptably. Due to the volumes of traffic along Washington Street, queuing can occur.

Washington Street at Route 3 Southbound Off-Ramp

Layout

The intersection is a three-legged "T" intersection with Washington Street running north and south. The northbound approach to the intersection has three through lanes and the southbound approach has two through lanes. South of the intersection, the northbound and southbound lanes are separated by a raised median, which runs from the intersection south to President Road. The eastbound approach to the intersection is the Route 3 southbound off-ramp, Ramp "E." This approach has three lanes: dual left-turn lanes, which are under signal control, and a right-turn lane, which is under yield control. A raised median island separates the left- and right-turn lanes..

A sidewalk is present only along the east side of Washington Street, and no crosswalks are present across Washington Street or the ramps. For safety reasons, no crossings are allowed at this location.

Land Use

The only development adjacent to the intersection is located on the southwest corner of the intersection and is residential. Again, these houses are provided access via Cavanaugh Road to Common Street. The intersection essentially sits on top of Route 3, so no other corners of the intersection could have development.

Signal System

This intersection is a three-way signalized intersection with the northbound signal heads located on a mast arm. Included on this mast arm is a signal head for the Route 3 off-ramp eastbound left-turn movement. The southbound movements have signal heads mounted on posts, located on the northeast corner, on the median between the northbound and southbound lanes, and on the Route 3 off-ramp's median island. There are two signal heads for the eastbound movements that are post-mounted, as well as the one signal head mounted on the mast-arm. There is no pedestrian equipment present, and none is needed as this is not a safe location for pedestrians to cross.

The intersection operates under an actuated, coordinated signal system, with loop detectors provided on all the approaches. The intersection is coordinated with the Independence Avenue/Church Street intersection to the north. The operation of the intersection is a simple two-phase operation, with no pedestrian phase.

Observations of Operation

Peak-hour field observations of this intersection indicated that traffic is heavy during the PM peak, and congestion was evident at that time.

Washington Street at Independence Avenue/Church Street

Layout

The intersection is a five-legged intersection with Washington Street being the northbound and southwest-bound approaches, Independence Avenue being the southbound approach, Church Street being the northwest-bound approach, and the Route 3 on-ramp being the fifth, eastern leg (departure only).

The northbound Washington Street approach consists of three general-purpose lanes (two proceed to Independence Avenue and one continues to Washington Street) and one exclusive left-turn lane.[1] The left-turn lane begins immediately after the Route 3 southbound off-ramp intersection and has approximately 220 feet of queue storage available. A narrow median divides the approach and departure lanes. The southbound Independence Avenue approach widens from two lanes to three lanes, with an exclusive left-turn lane added. The left-turn lane is approximately 260 feet in length. The right lane widens to allow the right-turning vehicles to

[1] The right turn lane to Church Street is not controlled by the traffic signal; a dedicated lane deviates from the northbound approach at about 100 feet upstream from the approach stop line.

Route 3 northbound to bypass the through vehicle lane, acting as a de facto right-turn lane without the pavement markings.

Northwest-bound Church Street widens from a single lane to three lanes at the intersection. In addition, a free right-turn lane is provided to Washington Street northbound at the approach that is separated from the other approach lanes by a median island. The three through lanes are all marked as general-purpose lanes, allowing traffic on all three to move to the Route 3 on-ramp departure. This departure is approximately 30 feet wide and does not allow for three through lanes of traffic. This could be the cause of some of the sideswipe crashes that have occurred at the intersection.

The southwest-bound Washington Street approach has two general-purpose lanes. Right turns are provided in a channelized right-turn lane. A median separates this lane from the other two lanes.

Sidewalks are present along the eastern side of the Washington Street and Independence Avenue approaches. Along Church Street, sidewalks are present on both sides of the street. The Washington Street southwest-bound approach also has sidewalks along both sides. Crosswalks are present across Church Street and Washington Street, allowing all pedestrian movements east of the intersection. No pedestrian movements are accommodated on the west side of the intersection, where the ramps are, for safety reasons.

Land Use

The land use adjacent to the intersection is mixed. The western portion of the intersection abuts Route 3 and its on-ramp, so no development has occurred. Located on the southeast corner between Washington Street and Church Street is South Shore Auto. Access to this business is provided from Church Street. The northeast corner of Church Street and Washington Street is the site of a parking lot with access to Capen Road. On the northern corner, between Washington Street and Independence Avenue, is the Archbishop Williams High School. The parking lot on the northeast corner provides parking for the school.

Signal System

The main signal heads are located on a span wire that runs from the southwest corner to the median island between Church Street and Washington Street. This span wire provides the primary signal indications for all of the approaches to the intersection. There is also one post-mounted signal head located on the median island between the approach/departure lanes on the northern part of Washington Street. All signal heads are standard three-section heads, except for two four-section signal heads provided for the Washington northbound approach. Pedestrian push buttons and signal indications are provided for all pedestrian movements.

This intersection has an actuated signal that is currently coordinated with the Route 3 southbound off-ramp intersection. The signal is essentially four-phase. The northbound Washington Street left turns and the southbound Independence Avenue left turns have a leading protected phase. This phase is followed by the north/south through movements. Church Street and Washington Street southbound have separate phases. Pedestrian movements are concurrent with other phases.

Observations of Operation

Peak-hour field observations of this intersection indicated that this is the busiest of the three intersections. Queuing is present on the Church Street and southbound Washington Street approaches.

TRAFFIC VOLUMES

MPO staff collected traffic volumes for the intersection by conducting manual turning movement counts on June 16 and June 18, 2009. Traffic volumes for the Common Street/President Road intersection are shown in Figure 2, for the Route 3 southbound off-ramp intersection in Figure 3, and for the Independence Avenue/Church Street intersection in Figure 4. Additional count data are in Appendix C. Overall traffic flows through the study area indicate that there is no peak directional flow during the peak hours, which are the analysis hours for this study. The PM peak hour is the heavier of the two time periods.

CRASH ANALYSIS

Staff gathered the most recent three years of crash data for the three intersections that were available from Registry of Motor Vehicle records. Tables 1, 2, and 3 provide the crash data for the Common Street/President Road, Route 3 southbound off-ramp, and Independence Avenue/Church Street intersections, respectively.

The Common Street/President Road intersection had 12 crashes over the three-year period, averaging 4 crashes a year. The majority of the crashes resulted in personal injury or property damage, and most were the angle or rear-end type. Angle and rear-end crashes are typical at signalized intersections. No pedestrian or bicyclist was involved in any of the crashes. The crash rate, calculated using MassDOT's Intersection Crash Rate Worksheet (see Appendix D), was 0.41. This is below the MassDOT Highway District 4 average of 0.78 for signalized intersections.

TABLE 1
Washington Street at Common Street/President Road:
Summary of RMV Crash Data (2005–2007)

		2005	2006	2007	2005-2007 Total	2005-2007 Average
Total Number of Crashes		**4**	**3**	**5**	**12**	**4**
Crash Severity	Property Damage Only	2	1	2	**5**	2
	Personal Injury	1	2	3	**6**	2
	Fatality	0	0	0	**0**	0
	Not Reported	1	0	0	**1**	0
Collision Type	Angle	0	2	3	**5**	2
	Rear-end	3	1	1	**5**	2
	Sideswipe	0	0	1	**1**	0
	Head-on	0	0	0	**0**	0
	Single Vehicle	0	0	0	**0**	0
	Not Reported	1	0	0	**1**	0
Roadway Conditions	Wet or icy pavement	1	1	1	**3**	1
	Dark/lighted	1	1	1	**3**	1
Weather Conditions	Clear	3	2	3	**8**	3
	Cloudy	0	0	2	**2**	1
	Rain	1	1	0	**2**	1
	Snow	0	0	0	**0**	0
Crashes during weekday peak periods[1]		1	3	1	**5**	2
Crashes involving pedestrian(s)		0	0	0	**0**	0
Crashes involving bicyclist(s)		0	0	0	**0**	0

1. Peak periods are from 7:00 to 9:00 AM and 4:00 to 6:00 PM.

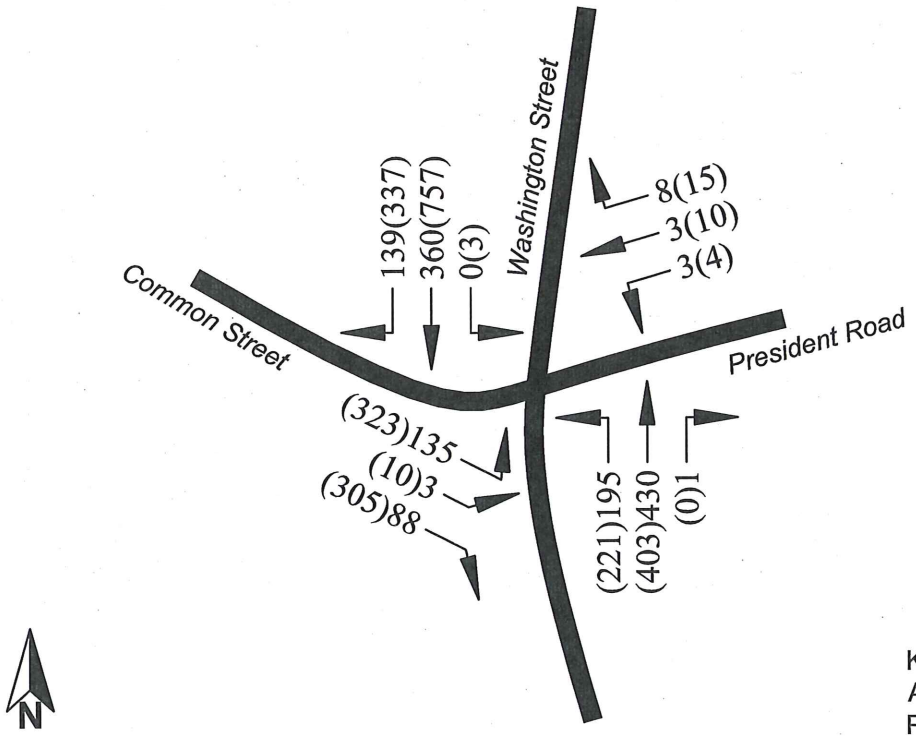

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FIGURE 2
Washington St. at Common St./ President Rd.: Traffic Volumes

Arterial Traffic Signal Improvements and Coordination: Braintree

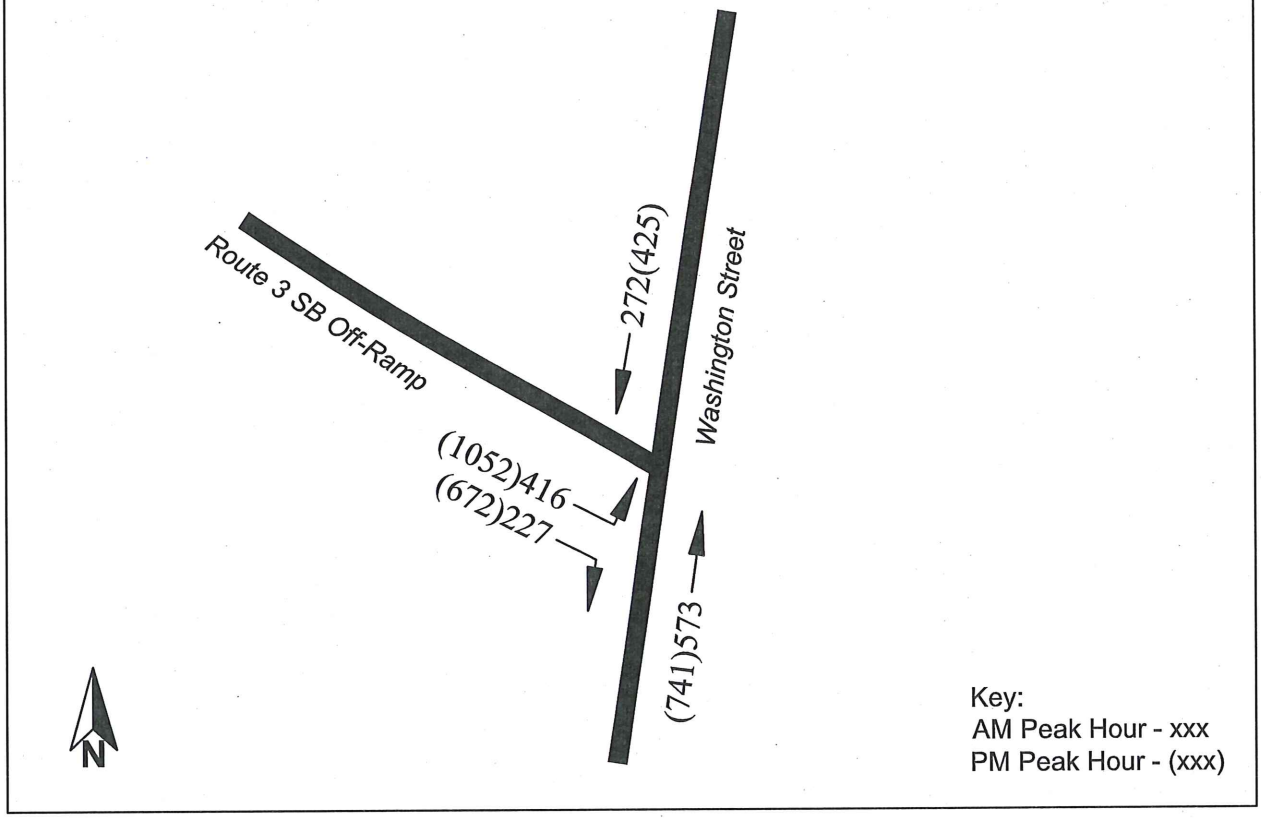

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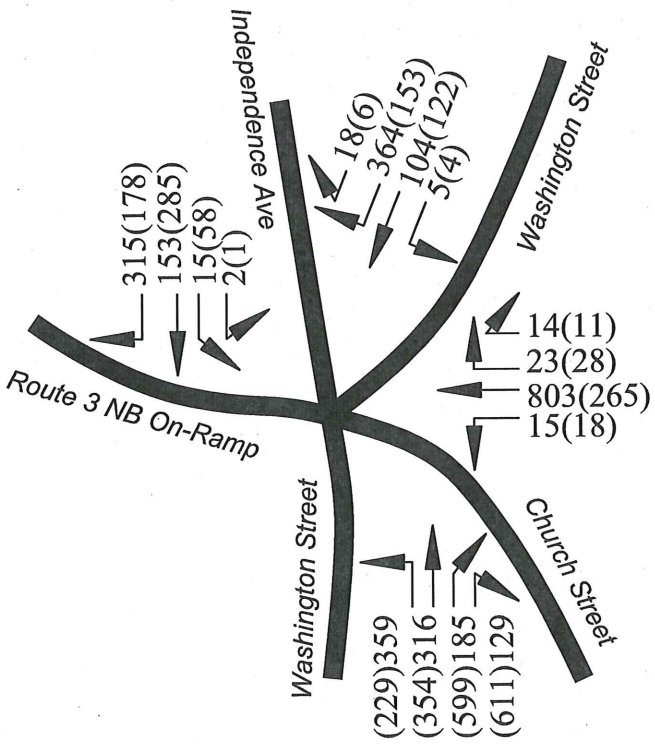
FIGURE 3
Washington St. at Route 3
Southbound Off-Ramp: Traffic Volumes

Arterial Traffic Signal Improvements and Coordination: Braintree



Key:
AM Peak Hour - xxx
PM Peak Hour - (xxx)

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FIGURE 4
Washington St. at Independence Ave. and Church St.: Traffic Volumes

Arterial Traffic Signal Improvements and Coordination: Braintree

The Route 3 southbound off-ramp intersection had 22 crashes over the three-year period, averaging just over 7 crashes a year. The majority of the crashes resulted in either property damage or personal injury, and most were rear-end crashes. No pedestrian or bicyclist was involved in any of the crashes. The crash rate for the intersection, calculated using MassDOT's Intersection Crash Rate Worksheet, was 0.63. This is below the MassDOT Highway District 4 average of 0.78 for signalized intersections.

TABLE 2
Washington Street at Route 3 Southbound Off-Ramp:
Summary of RMV Crash Data (2005–2007)

					2005-2007	
		2005	2006	2007	Total	Average
Total Number of Crashes		**10**	**2**	**10**	**22**	**7**
Crash Severity	Property Damage Only	4	1	5	**10**	3
	Personal Injury	6	0	4	**10**	3
	Fatality	0	0	0	**0**	0
	Not Reported	0	1	1	**2**	1
Collision Type	Angle	1	1	1	**3**	1
	Rear-end	8	1	5	**14**	5
	Sideswipe	0	0	1	**1**	0
	Head-on	0	0	0	**0**	0
	Single Vehicle	1	0	2	**3**	1
	Not Reported	0	0	1	**1**	0
Roadway Conditions	Wet or icy pavement	4	0	2	**6**	2
	Dark/lighted	1	0	2	**3**	1
Weather Conditions	Clear	8	1	7	**16**	5
	Cloudy	1	1	1	**3**	1
	Rain	1	0	1	**2**	1
	Snow	0	0	1	**1**	0
Crashes during weekday peak periods[1]		4	0	3	**7**	2
Crashes involving pedestrian(s)		0	0	0	**0**	0
Crashes involving bicyclist(s)		0	0	0	**0**	0

1. Peak periods are from 7:00 to 9:00 AM and 4:00 to 6:00 PM.

During the preparation of this memorandum, a concerned citizen of Braintree brought to the attention of MassDOT and CTPS a potential problem with signal visibility at the Washington Street and Route 3 southbound off-ramp intersection. The citizen mentioned that a number of crashes have occurred at this intersection due to vehicles' running the red light on the Washington Street southbound movement. These crashes were not evident in the latest crash data. However, due to the nature of the crashes, recommendations for improvements to alleviate this type of crash are included in the Conclusions and Recommendations section of this memorandum.

The Independence Avenue/Church Street intersection has a three-year total of 14 crashes, with a majority resulting in property damage only. Sideswipe collisions are the primary crash type that is occurring at this intersection. This probably can be attributed to the multilane movements made from all approaches through a quite wide intersection pavement. Under these conditions a vehicle can drift from one lane into another unintentionally. The crash rate for this intersection is 0.39, below the District 4 average of 0.78 for signalized intersections.

TABLE 3
Washington Street at Independence Avenue/Church Street:
Summary of RMV Crash Data (2005–2007)

					2005-2007	
		2005	2006	2007	Total	Average
Total Number of Crashes		**4**	**4**	**6**	**14**	**5**
Crash Severity	Property Damage Only	3	4	3	**10**	3
	Personal Injury	0	0	3	**3**	1
	Fatality	0	0	0	**0**	0
	Not Reported	1	0	0	**1**	0
Collision Type	Angle	0	1	1	**2**	1
	Rear-end	2	1	0	**3**	1
	Sideswipe	2	1	1	**4**	1
	Head-on	0	1	0	**1**	0
	Single Vehicle	0	0	2	**2**	1
	Not Reported	0	0	2	**2**	1
Roadway Conditions	Wet or icy pavement	1	3	0	**4**	1
	Dark/lighted	0	1	2	**3**	1
Weather Conditions	Clear	2	1	4	**7**	2
	Cloudy	1	0	2	**3**	1
	Rain	1	3	0	**4**	1
	Snow	0	0	0	**0**	0
Crashes during weekday peak periods[1]		1	1	3	**5**	2
Crashes involving pedestrian(s)		0	0	0	**0**	0
Crashes involving bicyclist(s)		0	0	0	**0**	0

1. Peak periods are from 7:00 to 9:00 AM and 4:00 to 6:00 PM.

DEVELOPMENT OF ALTERNATIVES

Staff examined various traffic signal designs and lane-use alternatives in conjunction with examining coordination between the three intersections. The software Synchro 7[2] was the analysis tool staff used to examine coordination and other strategies. Data from the Synchro capacity analysis are in Appendix E.

This section of Washington Street in Braintree is a heavily used commuter roadway that provides access to and from Route 3. The alternatives developed in this study are aimed at improving operations and easing congestion so as to efficiently move the traffic along the corridor.

Staff analyzed existing conditions and three alternatives:

- **Existing Geometry and Signal Design —** In this base-case scenario, signal timings and lane configurations at the three intersections are those existing currently in the field (see existing-conditions description above). Staff used the analysis results from this scenario as a basis for comparing the alternatives.

- **Alternative 1: Existing Geometry with Optimized Timings[3] —** In this option, staff optimized the signal timings at the isolated Common Street/President Road intersection and optimized the coordinated signal system at the Independence Avenue/Church Street and Route 3 southbound off-ramp intersections without altering existing geometry or lane configurations. The optimized coordination was examined as part of this alternative due to the existing coordination between the two intersections. A left-turn protected/permitted phase was included for the eastbound left turns at the Common Street/President Road intersection.

- **Alternative 2: Existing Geometry with Coordinated Timings —** In this alternative, staff provided a coordinated signal plan for all three intersections while maintaining the existing geometry and lane configurations. Coordination was optimized on both directions along Washington Street.

- **Alternative 3: Shared Northbound Right-Turn Lane on Washington Street with Coordinated Timings —** In this alternative, staff maintained the existing geometry and lane configurations at the Common Street/President Road and Route 3 southbound off-ramp intersections. One of the heavy PM peak movements through the Independence Avenue/Church Street intersection is the Washington Street northbound right turns to Washington Street. This traffic occupies a single lane under existing conditions. Proposed in this alternative is to utilize one of the existing through lanes as a shared through/right-turn lane. To accommodate the dual right-turn lanes, the departure on Washington would need to be widened by narrowing the median island between Church Street and Washington Street to the north of Church Street. In this alternative, staff also optimized the signal timings coordinated between the Route 3 southbound off-ramp and Independence Avenue/Church Street intersections. The Common Street/President Road intersection was optimized as an isolated intersection.

[2] Synchro by Trafficware, Version 7.
[3] Optimized timings: Signal timings are optimized to minimize delays associated with critical movements.

TRAFFIC OPERATIONS ANALYSIS

The traffic operations analysis for the intersections was conducted using Synchro 7.[4] Tables 4 and 5 show the results of the analyses for the AM and PM peak hours, respectively. Included in the analysis are estimates of energy measures of effectiveness, which provide information on energy savings and vehicle emissions. These are shown in Tables 6 and 7. Complete data from the Synchro capacity analysis are in Appendix E.

Existing Geometry and Signal Design

The existing-conditions analysis indicates that the Common Street/President Road and Route 3 southbound off-ramp intersections are each operating at an acceptable level of service (LOS) in both peak hours under existing conditions: LOS B (AM) and D (PM) at Common Street/President Road and LOS B (AM) and C (PM) at Route 3 southbound off-ramp. The only discernable problem that may be occurring is at the Common Street approach in the PM peak hour, where the analysis indicates LOS E and a queue of 675 feet or approximately 25 vehicles (25 feet per vehicle is used to equate queue length to feet). The presumable cause is that this approach carries cut-through traffic from Route 37 via Staten Street that is avoiding the Braintree Split.

The Independence Avenue/Church Street intersection operates poorly in both peak hours, at LOS F overall. In the AM peak, the Church Street and Washington Street approaches operate at LOS F. Then in the PM, Washington Street northbound operates at LOS F. The poor levels of service can be attributed to the high traffic volumes and the overall design of the intersection, where the geometry dictates that separate phasing be used for the Church Street and northern Washington Street approaches.

Alternative 1: Existing Geometry with Optimized Timings

The optimized timings at the Common Street/President Road intersection resulted in marginal improvements at that location over existing conditions in both peak hours. Overall LOS remained the same. The optimized coordinated timings improved the operations at the Route 3 southbound off-ramp and Independence Avenue/Church Street intersections dramatically in the AM peak. The Route 3 southbound off-ramp intersection improved to LOS A from B and the Independence Avenue/Church Street intersection to D from F.

Alternative 2: Existing Geometry with Coordinated Timings

In this alternative, where staff examined a coordinated signal system between the three intersections, operations remained relatively the same as under existing conditions. There was a minimal benefit from the coordination for progression or bandwidth[5] of vehicles traveling in both directions.

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[4] Synchro by Trafficware, Version 7.

[5] Bandwidth: The amount of green time available for vehicles to travel through intersections in a coordinated signal system.

Alternative 3: Shared Northbound Right-Turn Lane on Washington Street with Coordinated Timings

This alternative improved the operation of the Independence Avenue/Church Street intersection tremendously. The LOS at this intersection improved to D from F in the AM and to LOS C from F in the PM. The PM peak hour is where the problem with the northbound right turn to Washington Street is now occurring. This alternative's solution of that problem is by itself a significant improvement for operations. Also, as described previously, it was found that the Common Street/President Road intersection operated better as an isolated intersection, not coordinated with the other two intersections.

In addition, this alternative was the most fuel-efficient and emissions-friendly of the alternatives examined. As Table 7 shows, under this alternative there was a significant reduction in the gallons of fuel consumed in the overall Washington Street corridor.

CONCLUSIONS AND RECOMMENDATIONS

It was found that the Common Street/President Road and Route 3 southbound off-ramp intersections operate at acceptable levels of service under existing conditions, so staff confined its investigation of potential improvements to signal phasing and timing and to signal coordination. However, the Independence Avenue/Church Street intersection has problems in both peak hours, operating at LOS F under existing conditions, so staff examined not only possible signal-related improvements but also a geometric change.

The results of the alternatives analysis indicated that Alternative 3, Shared Northbound Right-Turn Lane on Washington Street with Coordinated Timings, would provide the greatest benefits by far. It would improve operations by easing congestion and reducing the number of stopping vehicles. Based on these findings, staff recommends that Alternative 3 be implemented. It is also the most fuel-efficient or emissions-friendly of the alternatives examined, and it has no negative impact on pedestrians.

Alternative 3 maintains the coordination between the Route 3 southbound off-ramp and Independence Avenue/Church Street intersections, and at the latter intersection it provides a second lane for northbound right turns onto Washington by converting one of the existing through lanes to a shared through/right-turn lane. As described previously, the median island between Church Street and Washington Street would need to be modified to accommodate the dual right turns. Pavement markings would also need to be changed to indicate the shared through/right-turn lane. No signal head replacement would be necessary. All other approaches would remain as they exist today. The current pedestrian phasing and timing would be maintained at all intersections.

The Alternative 3 improvements should be simple to implement and are cost-effective as well. They require no land takings and can be accomplished with striping, signal timing changes, signing, and a minor alteration to a median island. Braintree should pursue implementation of these improvements in order to improve travel operations along Washington Street.

In addition to the operational improvements outlined above, some signal equipment changes should be made to address the potential crashes at the Washington Street and Route 3 southbound ramp intersection brought up by a citizen of Braintree. The potential red light running on the Washington Street southbound approach needs to be addressed with signal head upgrades. That approach currently has post-mounted signal heads. These signal heads should be moved onto a mast arm, with a signal head placed over each southbound approach lane. Another issue with this approach is the visibility from this intersection of the signal indications at the Washington Street and Common Street/President Road intersection. The Braintree citizen noted that during nighttime operations, these indications are clearly visible and create confusion for southbound drivers at the Route 3 off-ramp intersection, which may lead to potential crashes occurring due to red light running. Optically programmed signal heads should be installed at the Common Street/President Road intersection's southbound approach. Optically programmed signal heads can be adjusted to eliminate upstream visibility at the Route 3 off-ramp intersection. These signal head improvements should alleviate the likelihood of southbound red light running and of potential resultant crashes.

TABLE 4
AM Peak Hour
Level-of-Service Summary

Intersection/Approach	Existing Conditions				Alternative 1				Alternative 2				Alternative 3			
	LOS	Delay[1]	V/C[2]	Q[3]	LOS	Delay	V/C	Q	LOS	Delay	V/C	Q	LOS	Delay	V/C	Q
Washington St at Common St																
Washington St – NB	B	12.1	0.56	266	B	11.5	0.58	229	A	7.5	0.46	220	A	8.7	0.47	244
Washington St – SB	B	18.7	0.47	225	B	18.2	0.52	188	A	9.8	0.34	157	B	15.3	0.34	207
Common St – EB	C	25.8	0.54	204	C	25.1	0.62	182	D	54.2	0.86	178	D	44.4	0.73	152
President Rd – WB	C	22.5	0.12	57	C	20.7	0.04	35	C	33.7	0.05	16	C	34.5	0.04	34
Overall	**B**	**17.1**	**0.55**	**-**	**B**	**16.5**	**0.58**	**-**	**B**	**16.7**	**0.55**	**-**	**B**	**17.6**	**0.54**	**-**
Washington St at Off-Ramp																
Washington St – NB	A	6.1	0.19	71	A	7.6	0.27	55	A	8.7	0.26	81	A	7.6	0.26	60
Washington St – SB	A	5.8	0.13	51	A	3.5	0.19	27	A	3.4	0.18	31	A	3.3	0.19	29
Off-Ramp – EB	C	22.3	0.67	158	A	8.6	0.50	70	A	9.3	0.51	72	A	9.0	0.50	69
Overall	**B**	**13.3**	**0.31**	**-**	**A**	**7.4**	**0.36**	**-**	**A**	**8.1**	**0.35**	**-**	**A**	**7.5**	**0.36**	**-**
Washington St at Independence Ave																
Washington St – NB	B	14.6	0.50	194	C	25.4	0.80	309	C	24.9	0.78	300	C	25.9	0.76	272
Independence Ave – SB	C	25.8	0.47	204	D	41.5	0.85	277	D	38.7	0.80	273	D	39.1	0.81	271
Church St – WB	F	175.9	1.26	392	D	46.5	0.92	255	D	49.7	0.93	272	D	53.9	0.96	274
Washington St - SW	F	285.9	1.61	456	D	50.1	0.91	271	D	50.3	0.89	277	D	51.5	0.91	277
Overall	**F**	**115.7**	**0.78**	**-**	**D**	**39.3**	**0.91**	**-**	**D**	**39.6**	**0.83**	**-**	**D**	**41.5**	**0.83**	**-**

1. Delay measured in seconds.
2. V/C = volume/capacity ratio.
3. 95% queue, measured in feet.

TABLE 5
PM Peak Hour
Level-of-Service Summary

	Existing Conditions				Alternative 1				Alternative 2				Alternative 3			
Intersection/Approach	**LOS**	**Delay[1]**	**V/C[2]**	**Q[2]**	**LOS**	**Delay**	**V/C**	**Q**	**LOS**	**Delay**	**V/C**	**Q**	**LOS**	**Delay**	**V/C**	**Q**
Washington St at Common St																
Washington St – NB	C	24.3	0.80	374	C	34.4	0.91	411	C	25.7	0.86	413	D	38.4	0.95	413
Washington St – SB	D	36.9	0.86	701	D	39.7	0.86	765	B	15.2	0.71	762	D	39.7	0.86	760
Common St – EB	E	73.6	1.05	675	E	55.5	0.93	625	F	87.0	1.06	596	D	52.4	0.92	612
President Rd – WB	C	32.1	0.05	37	C	31.7	0.05	35	D	42.3	0.06	35	C	30.7	0.05	35
Overall	**D**	**43.3**	**0.91**	**-**	**D**	**42.4**	**0.88**	**-**	**D**	**37.8**	**0.89**	**-**	**D**	**42.7**	**0.90**	**-**
Washington St at Off-Ramp																
Washington St – NB	B	13.2	0.46	104	C	23.5	0.48	209	C	23.7	0.48	177	B	16.9	0.59	113
Washington St – SB	B	14.5	0.55	85	C	24.9	0.56	191	C	24.3	0.56	177	B	15.2	0.69	78
Off-Ramp – EB	C	29.6	0.97	452	C	26.7	0.81	521	C	26.5	0.81	516	B	13.1	0.75	273
Overall	**C**	**20.7**	**0.71**	**-**	**C**	**25.2**	**0.67**	**-**	**C**	**25.1**	**0.67**	**-**	**B**	**14.8**	**0.73**	**-**
Washington St at Independence Ave																
Washington St – NB	F	205.5	1.56	1663	F	108.7	1.26	1621	F	110.4	1.27	1887	C	20.0	0.96	354
Independence Ave – SB	B	18.2	0.19	110	B	12.0	0.14	85	B	12.8	0.14	65	B	18.9	0.29	87
Church St – WB	D	48.5	0.63	116	F	98.2	0.95	183	F	94.4	0.94	124	C	28.1	0.52	74
Washington St - SW	E	63.5	0.81	231	F	152.4	1.11	313	F	147.0	1.09	309	D	43.1	0.80	166
Overall	**F**	**138.9**	**1.24**	**-**	**F**	**95.1**	**1.12**	**-**	**F**	**95.3**	**1.12**	**-**	**C**	**23.3**	**0.75**	**-**

1. Delay measured in seconds.
2. V/C = volume/capacity ratio.
3. 95% queue, measured in feet.

TABLE 6
AM Peak Hour
Energy Measures of Effectiveness

Intersection/MOEs	Existing	Alt. 1	Alt. 2	Alt. 3
Washington at Common				
Fuel Consumed (gal)	16	16	14	15
Fuel Economy (mpg)	8.0	8.0	9.0	8.4
CO Emissions (kg)	1.12	1.12	0.99	1.07
NOx Emissions (kg)	0.22	0.22	0.19	0.21
VOC Emissions (kg)	0.26	0.26	0.23	0.25
Washington at Off-Ramp				
Fuel Consumed (gal)	14	12	12	12
Fuel Economy (mpg)	9.9	11.1	11.0	10.9
CO Emissions (kg)	0.95	0.85	0.85	0.86
NOx Emissions (kg)	0.18	0.16	0.17	0.17
VOC Emissions (kg)	0.22	0.20	0.20	0.20
Washington at Independence				
Fuel Consumed (gal)	84	50	50	51
Fuel Economy (mpg)	3.7	6.2	6.2	6.1
CO Emissions (kg)	5.88	3.47	3.47	3.54
NOx Emissions (kg)	1.14	0.67	0.68	0.69
VOC Emissions (kg)	1.36	0.80	0.80	0.82
Washington Arterial				
Fuel Consumed (gal)	43	26	26	26
Fuel Economy (mpg)	4.1	6.8	6.9	6.8
CO Emissions (kg)	3.02	1.82	1.80	1.82
NOx Emissions (kg)	0.59	0.35	0.35	0.35
VOC Emissions (kg)	0.70	0.42	0.42	0.42

TABLE 7
PM Peak Hour
Energy Measures of Effectiveness

Intersection/MOEs	Existing	Alt. 1	Alt. 2	Alt. 3
Washington at Common				
Fuel Consumed (gal)	37	49	35	48
Fuel Economy (mpg)	6.3	4.8	6.8	4.9
CO Emissions (kg)	2.62	3.43	2.42	3.37
NOx Emissions (kg)	0.51	0.67	0.47	0.66
VOC Emissions (kg)	0.61	0.79	0.56	0.78
Washington at Off-Ramp				
Fuel Consumed (gal)	34	36	37	29
Fuel Economy (mpg)	7.6	7.2	7.1	9.0
CO Emissions (kg)	2.39	2.54	2.56	2.04
NOx Emissions (kg)	0.47	0.49	0.50	0.40
VOC Emissions (kg)	0.55	0.59	0.59	0.47
Washington at Independence				
Fuel Consumed (gal)	108	76	76	34
Fuel Economy (mpg)	2.8	4.0	4.0	8.8
CO Emissions (kg)	7.56	5.33	5.34	2.40
NOx Emissions (kg)	1.47	1.04	1.04	0.47
VOC Emissions (kg)	1.75	1.23	1.24	0.56
Washington Arterial				
Fuel Consumed (gal)	101	68	69	28
Fuel Economy (mpg)	2.4	3.6	3.5	8.6
CO Emissions (kg)	7.07	4.77	4.80	1.97
NOx Emissions (kg)	1.37	0.93	0.93	0.38
VOC Emissions (kg)	1.64	1.11	1.11	0.46

Appendix A

Universe of Potential
Signal Coordination Locations

Universe of Intersection Locations

Town/City	Location	2005-2007 # Crashes	EPDO*
Burlington	Route 3A @ Francis Wyman Rd. (Route 62)	3	3
Burlington	Route 3A @ Wilmington Rd. (Route 62)	3	15
Danvers	Conant St @ Poplar St.	2	6
Danvers	Conant St @ Elliott St	6	18
Hingham	Route 3A @ Kilby St	1	5
Hingham	Route 3 A @ Summer St	1	5
Bedford	**Route 4/225 @ Great Road Shopping Center**	**6**	**10**
Bedford	**Route 4/225 @ Shawsheen Rd**	**10**	**18**
Lexington	**Route 4/225 @ Hartwell Ave.**	**36**	**68**
Maynard	Acton St @ Main St and Summer St	5	5
Maynard	Acton St @ Powder Mill Rd	7	15
Randolph	**Route 28 @ Warren St**	**44**	**76**
Randolph	**Route 28 @ Memorial Ave**	**19**	**35**
Randolph	**Route 28 @ N. Main St**	**43**	**67**
Weymouth	**Route 53 @ Pleasant St**	**96**	**64**
Weymouth	**Route 53 @ Mutton Lane**	**28**	**40**
Braintree	**Washington St @ Common St**	**12**	**36**
Braintree	**Washington St @ Ramp E**	**22**	**62**
Braintree	**Washington St @ Independence Ave**	**14**	**26**
Peabody	Route 114 @ Cross St	6	10
Peabody	Route 114 @ North Shore Mall	7	7
Peabody	Route 114 @ Loris St	6	18

***EPDO - Equivalent Property Damage Only**

EPDO = 10*Fatal Crashes + 5*Injury Crashes + 1*Other Crashes (Property Damage Only or Not Reported)

Appendix B

Correspondence

Mark Abbott

From: Raphael, Connie (MHD) [Connie.Raphael@state.ma.us]
Sent: Monday, June 08, 2009 11:55 AM
To: Mark Abbott
Cc: Kulen, Raj (MHD)
Subject: RE: District 4 Arterial Intersections

Sorry for the delay in getting back to you. Our traffic engineers were out of the office most of last week.

We agree with the Route4/225 at Shawsheen Road and Home Goods plaza. The intersection at Hartwell Road is fairly far away and our concern there is back up toward Route 128. So if you include Hartwell be sure to check the queuing.

The Weymouth locations are another good choice.

Our traffic section has two other suggestions.

Braintree - Washington Street at Ramp E; Washington Street at Presidential/Common Street; and Washington Street at Church/Independence and Ramp F

Peabody - Route 114 at Cross; Route 114 at North Shore Mall; and Route 114 at Loris

Connie
-----Original Message-----
From: Mark Abbott [mailto:mabbott@ctps.org]
Sent: Monday, June 08, 2009 11:01 AM
To: 'Raphael, Connie (MHD)'
Subject: RE: District 4 Arterial Intersections

Connie,

Have you heard anything from Mike concerning any possible locations.

Two locations we've come up with are Route 4 in Lexington at Shawsheen Road and at the signal at the Home Goods shopping plaza. Also possibly inlcuding Brooksbie Road (unsignalized) and Hartwell Avenue. The other location is in Weymouth on Route 53 at Pleasant Street and at Mutton Lane signalized intersections. The Pleasant Street intersection is #70 on the MassHighway crash list.

What are you thoughts on these two locations.

Thanks,

Mark

-----Original Message-----
From: Raphael, Connie (MHD) [mailto:Connie.Raphael@state.ma.us]
Sent: Monday, June 01, 2009 3:33 PM
To: Mark Abbott
Subject: RE: District 4 Arterial Intersections

Hi Mark,

I referred the study material to Mike Karas, Manager of Traffic Operations. I will get back to you with any suggestions.

Connie

-----Original Message-----
From: Mark Abbott [mailto:mabbott@ctps.org]

Sent: Monday, June 01, 2009 3:25 PM
To: Raphael, Connie (MHD)
Subject: District 4 Arterial Intersections

Connie,

We (CTPS) has a study to look at signal improvements and coordination at several locations. I've attached the scope of work that was approved for this study, so you can have a better understanding of the study.

Efi and I are wondering if you have any possible suggestions of intersections which we could include in this study. Please let me know.

Thanks,

Mark S. Abbott, P.E.
Central Transportation Planning Staff
10 Park Plaza, Suite 2150
Boston, MA. 02116
email: mabbott@ctps.org
phone: 617-973-7095
fax: 617-973-8855

Appendix C

Turning Movement Counts

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Common/President

File Name : 6_18_AM_SG
Site Code : 06180711
Start Date : 06/18/2009
Page No : 1

Groups Printed- Cars - Trucks, Buses, & Peds

	Washington St - Northbound				Washington St - Southbound				Common St - Eastbound				President Rd - Westbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	32	111	2	0	0	50	22	0	23	0	5	1	0	0	1	0	247
07:15 AM	29	154	0	0	0	73	28	0	25	1	13	1	0	0	2	0	326
07:30 AM	47	109	0	2	0	71	26	0	37	0	13	0	1	0	2	2	310
07:45 AM	56	152	0	0	0	122	39	0	44	0	19	0	1	2	1	0	436
Total	164	526	2	2	0	316	115	0	129	1	50	2	2	2	6	2	1319
08:00 AM	42	125	0	0	0	96	33	0	39	0	25	0	2	0	5	0	367
08:15 AM	52	117	1	1	0	75	38	0	35	0	14	0	0	0	0	1	334
08:30 AM	45	130	0	0	0	87	36	0	47	0	30	1	0	1	2	2	381
08:45 AM	41	94	0	0	0	90	36	0	25	0	31	0	0	2	3	1	323
Total	180	466	1	1	0	348	143	0	146	0	100	1	2	3	10	4	1405
Grand Total	344	992	3	3	0	664	258	0	275	1	150	3	4	5	16	6	2724
Apprch %	25.6	73.9	0.2	0.2	0.0	72.0	28.0	0.0	64.1	0.2	35.0	0.7	12.9	16.1	51.6	19.4	
Total %	12.6	36.4	0.1	0.1	0.0	24.4	9.5	0.0	10.1	0.0	5.5	0.1	0.1	0.2	0.6	0.2	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Common/President

File Name : 6_18_AM_SG
Site Code : 06180711
Start Date : 06/18/2009
Page No : 2

	Washington St - Northbound					Washington St - Southbound					Common St - Eastbound					President Rd - Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Intersection	07:45 AM																				
Volume	195	524	1	1	721	0	380	146	0	526	165	0	88	1	254	3	3	8	3	17	1518
Percent	27.0	72.7	0.1	0.1		0.0	72.2	27.8	0.0		65.0	0.0	34.6	0.4		17.6	17.6	47.1	17.6		
07:45 Volume	56	152	0	0	208	0	122	39	0	161	44	0	19	0	63	1	2	1	0	4	436
Peak Factor																					0.870
High Int.	07:45 AM					07:45 AM					08:30 AM					08:00 AM					
Volume	56	152	0	0	208	0	122	39	0	161	47	0	30	1	78	2	0	5	0	7	
Peak Factor					0.867					0.817					0.814					0.607	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Common/President

File Name : 6_18_AM_SG
Site Code : 06180711
Start Date : 06/18/2009
Page No : 1

Groups Printed- Trucks, Buses, & Peds

	Washington St - Northbound				Washington St - Southbound				Common St - Eastbound				President Rd - Westbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	0	3	0	0	0	4	1	0	1	0	0	0	0	0	0	0	9
07:15 AM	0	3	0	0	0	4	2	0	1	0	2	0	0	0	0	0	12
07:30 AM	0	2	0	0	0	3	1	0	2	0	0	0	0	0	0	0	8
07:45 AM	2	7	0	0	0	6	0	0	0	0	0	0	0	0	0	0	15
Total	2	15	0	0	0	17	4	0	4	0	2	0	0	0	0	0	44
08:00 AM	0	2	0	0	0	8	0	0	0	0	0	0	1	0	1	0	12
08:15 AM	2	7	0	0	0	2	0	0	0	0	0	0	0	0	0	0	11
08:30 AM	2	7	0	0	0	3	1	0	1	0	4	0	0	0	0	0	18
08:45 AM	2	7	0	0	0	4	3	0	1	0	1	0	0	0	0	0	18
Total	6	23	0	0	0	17	4	0	2	0	5	0	1	0	1	0	59
Grand Total	8	38	0	0	0	34	8	0	6	0	7	0	1	0	1	0	103
Apprch %	17.4	82.6	0.0	0.0	0.0	81.0	19.0	0.0	46.2	0.0	53.8	0.0	50.0	0.0	50.0	0.0	
Total %	7.8	36.9	0.0	0.0	0.0	33.0	7.8	0.0	5.8	0.0	6.8	0.0	1.0	0.0	1.0	0.0	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Common/President

File Name : 6_18_AM_SG
Site Code : 06180711
Start Date : 06/18/2009
Page No : 2

	Washington St - Northbound					Washington St - Southbound					Common St - Eastbound					President Rd - Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Intersection	08:00 AM																				
Volume	6	23	0	0	29	0	17	4	0	21	2	0	5	0	7	1	0	1	0	2	59
Percent	20.7	79.3	0.0	0.0		0.0	81.0	19.0	0.0		28.6	0.0	71.4	0.0		50.0	0.0	50.0	0.0		
08:45 Volume	2	7	0	0	9	0	4	3	0	7	1	0	1	0	2	0	0	0	0	0	18
Peak Factor																					0.819
High Int.	08:15 AM					08:00 AM					08:30 AM					08:00 AM					
Volume	2	7	0	0	9	0	8	0	0	8	1	0	4	0	5	1	0	1	0	2	
Peak Factor					0.806					0.656					0.350					0.250	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Common/President

File Name : 6_18_AM_SG
Site Code : 06180711
Start Date : 06/18/2009
Page No : 1

Groups Printed- Bikes

	Washington St - Northbound				Washington St - Southbound				Common St - Eastbound				President Rd - Westbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Total	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Grand Total	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Apprch %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Common/President

File Name : 6_18_AM_SG
Site Code : 06180711
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	Washington St - Northbound					Washington St - Southbound					Common St - Eastbound					President Rd - Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Intersection	08:00 AM																				
Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1
Percent	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0	100.0		0.0	0.0	0.0	0.0		
08:45 Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1
Peak Factor																					0.250
High Int.	6:45:00 AM					6:45:00 AM					08:45 AM					6:45:00 AM					
Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1						
Peak Factor															0.250						

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Common/President

File Name : Washington at Common - PM
Site Code : 06180712
Start Date : 06/18/2009
Page No : 1

Groups Printed- Cars - Trucks, Buses, & Peds

	Washington St - Northbound				Washington St - Southbound				Common St - Eastbound				President Rd - Westbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	35	63	0	0	0	152	79	0	64	0	61	0	0	2	2	0	458
04:15 PM	44	91	0	1	1	178	81	0	56	11	63	0	2	1	0	0	529
04:30 PM	60	92	0	1	0	216	68	0	63	0	38	0	1	1	4	1	545
04:45 PM	31	88	0	0	1	235	76	1	82	0	74	0	0	4	4	0	596
Total	170	334	0	2	2	781	304	1	265	11	236	0	3	8	10	1	2128
05:00 PM	55	102	0	1	0	187	81	0	74	0	81	0	0	2	3	1	587
05:15 PM	51	96	0	0	0	216	93	0	65	0	79	0	2	3	4	0	609
05:30 PM	73	95	0	2	2	191	87	0	75	0	65	0	2	2	4	3	601
05:45 PM	42	83	0	0	1	211	95	0	87	1	80	0	0	3	4	0	607
Total	221	376	0	3	3	805	356	0	301	1	305	0	4	10	15	4	2404
Grand Total	391	710	0	5	5	1586	660	1	566	12	541	0	7	18	25	5	4532
Apprch %	35.4	64.2	0.0	0.5	0.2	70.4	29.3	0.0	50.6	1.1	48.3	0.0	12.7	32.7	45.5	9.1	
Total %	8.6	15.7	0.0	0.1	0.1	35.0	14.6	0.0	12.5	0.3	11.9	0.0	0.2	0.4	0.6	0.1	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Common/President

File Name : Washington at Common - PM
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	Washington St - Northbound					Washington St - Southbound					Common St - Eastbound					President Rd - Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	05:00 PM																				
Volume	221	376	0	3	600	3	805	356	0	1164	301	1	305	0	607	4	10	15	4	33	2404
Percent	36.8	62.7	0.0	0.5		0.3	69.2	30.6	0.0		49.6	0.2	50.2	0.0		12.1	30.3	45.5	12.1		
05:15 Volume	51	96	0	0	147	0	216	93	0	309	65	0	79	0	144	2	3	4	0	9	609
Peak Factor																					0.987
High Int.	05:30 PM					05:15 PM					05:45 PM					05:30 PM					
Volume	73	95	0	2	170	0	216	93	0	309	87	1	80	0	168	2	2	4	3	11	
Peak Factor					0.882					0.942					0.903					0.750	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Common/President

File Name : Washington at Common - PM
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Groups Printed- Trucks, Buses, & Peds

	Washington St - Northbound				Washington St - Southbound				Common St - Eastbound				President Rd - Westbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
04:15 PM	0	1	0	0	0	3	1	0	0	0	2	0	0	0	0	0	7
04:30 PM	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	6
04:45 PM	0	2	0	0	0	1	0	1	0	0	0	0	0	0	0	0	4
Total	0	6	0	0	0	7	3	1	0	0	2	0	0	0	0	0	19
05:00 PM	0	1	0	0	0	5	0	0	0	0	1	0	0	0	0	0	7
05:15 PM	0	1	0	0	0	3	2	0	0	0	0	0	0	0	0	0	6
05:30 PM	0	1	0	0	0	3	1	0	0	0	0	0	0	0	0	0	5
05:45 PM	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	4
Total	0	4	0	0	0	14	3	0	0	0	1	0	0	0	0	0	22
Grand Total	0	10	0	0	0	21	6	1	0	0	3	0	0	0	0	0	41
Apprch %	0.0	100.0	0.0	0.0	0.0	75.0	21.4	3.6	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	
Total %	0.0	24.4	0.0	0.0	0.0	51.2	14.6	2.4	0.0	0.0	7.3	0.0	0.0	0.0	0.0	0.0	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Common/President

File Name : Washington at Common - PM
Site Code : 06180712
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	Washington St - Northbound					Washington St - Southbound					Common St - Eastbound					President Rd - Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:15 PM																				
Volume	0	7	0	0	7	0	12	1	1	14	0	0	3	0	3	0	0	0	0	0	24
Percent	0.0	100.0	0.0	0.0		0.0	85.7	7.1	7.1		0.0	0.0	100.0	0.0		0.0	0.0	0.0	0.0		
05:00 Volume	0	1	0	0	1	0	5	0	0	5	0	0	1	0	1	0	0	0	0	0	7
Peak Factor																					0.857
High Int.	04:30 PM					05:00 PM					04:15 PM					3:45:00 PM					
Volume	0	3	0	0	3	0	5	0	0	5	0	0	2	0	2						
Peak Factor					0.583					0.700					0.375						

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ARTERIAL INTERSECTIONS
Braintree
Washington at Common/President

File Name : Washington at Common - PM
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Groups Printed- Bikes

	Washington St - Northbound				Washington St - Southbound				Common St - Eastbound				President Rd - Westbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	1	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	4
Total	1	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	4
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Total	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Grand Total	1	0	0	0	0	0	1	2	0	0	0	1	0	0	0	0	5
Apprch %	100.0	0.0	0.0	0.0	0.0	0.0	33.3	66.7	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	
Total %	20.0	0.0	0.0	0.0	0.0	0.0	20.0	40.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	

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ARTERIAL INTERSECTIONS
Braintree
Washington at Common/President

File Name : Washington at Common - PM
Site Code : 06180712
Start Date : 06/18/2009

	Washington St - Northbound					Washington St - Southbound					Common St - Eastbound					President Rd - Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:00 PM																				
Volume	1	0	0	0	1	0	0	1	2	3	0	0	0	0	0	0	0	0	0	0	4
Percent	100.0	0.0	0.0	0.0		0.0	0.0	33.3	66.7		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		
04:45 Volume	1	0	0	0	1	0	0	1	2	3	0	0	0	0	0	0	0	0	0	0	4
Peak Factor																					0.250
High Int.	04:45 PM					04:45 PM					3:45:00 PM					3:45:00 PM					
Volume	1	0	0	0	1	0	0	1	2	3											
Peak Factor					0.250					0.250											

CTPS
ARTERIAL INTERSECTIONS
Braintree

Washington at Expressway Off-Ramp

File Name : Washington at Route 3 Ramp - AM
Site Code : 06180601
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Groups Printed- Cars - Trucks, Buses, & Peds

	Washington St - Northbound								Washington St - Southbound				Route 3 Ramp - Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	0	32	0	0	0	0	0	0	0	134	0	0	82	0	43	0	291
07:15 AM	0	56	0	0	0	0	0	0	0	139	0	0	74	0	43	0	312
07:30 AM	0	67	0	0	0	0	0	0	0	159	0	4	105	0	68	0	403
07:45 AM	0	79	0	0	0	0	0	0	0	168	0	0	111	0	74	0	432
Total	0	234	0	0	0	0	0	0	0	600	0	4	372	0	228	0	1438
08:00 AM	0	80	0	0	0	0	0	0	0	175	0	0	84	0	45	0	384
08:15 AM	0	67	0	0	0	0	0	1	0	155	0	1	116	0	40	1	381
08:30 AM	0	65	0	0	0	0	0	2	0	154	0	1	91	0	57	2	372
08:45 AM	0	67	0	2	0	0	0	0	0	127	0	1	106	0	61	0	364
Total	0	279	0	2	0	0	0	3	0	611	0	3	397	0	203	3	1501
Grand Total	0	513	0	2	0	0	0	3	0	1211	0	7	769	0	431	3	2939
Apprch %	0.0	99.6	0.0	0.4	0.0	0.0	0.0	100.0	0.0	99.4	0.0	0.6	63.9	0.0	35.8	0.2	
Total %	0.0	17.5	0.0	0.1	0.0	0.0	0.0	0.1	0.0	41.2	0.0	0.2	26.2	0.0	14.7	0.1	

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ARTERIAL INTERSECTIONS
Braintree
Washington at Expressway Off-Ramp

File Name : Washington at Route 3 Ramp - AM
Site Code : 06180601
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	Washington St - Northbound										Washington St - Southbound					Route 3 Ramp - Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Intersection	07:30 AM																				
Volume	0	293	0	0	293	0	0	0	1	1	0	657	0	5	662	416	0	227	1	644	1600
Percent	0.0	100.0	0.0	0.0		0.0	0.0	0.0	100.0		0.0	99.2	0.0	0.8		64.6	0.0	35.2	0.2		
07:45 Volume	0	79	0	0	79	0	0	0	0	0	0	168	0	0	168	111	0	74	0	185	432
Peak Factor																					0.926
High Int.	08:00 AM					08:15 AM					08:00 AM					07:45 AM					
Volume	0	80	0	0	80	0	0	0	1	1	0	175	0	0	175	111	0	74	0	185	
Peak Factor					0.916					0.250					0.946					0.870	

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ARTERIAL INTERSECTIONS
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Washington at Expressway Off-Ramp

File Name : Washington at Route 3 Ramp - AM
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Groups Printed- Trucks, Buses, & Peds

	Washington St - Northbound								Washington St - Southbound				Route 3 Ramp - Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	0	1	0	0	0	0	0	0	0	1	0	0	3	0	2	0	7
07:15 AM	0	4	0	0	0	0	0	0	0	2	0	0	2	0	2	0	10
07:30 AM	0	1	0	0	0	0	0	0	0	6	0	2	8	0	2	0	19
07:45 AM	0	2	0	0	0	0	0	0	0	2	0	0	14	0	5	0	23
Total	0	8	0	0	0	0	0	0	0	11	0	2	27	0	11	0	59
08:00 AM	0	4	0	0	0	0	0	0	0	2	0	0	4	0	3	0	13
08:15 AM	0	1	0	0	0	0	0	0	0	8	0	0	5	0	2	0	16
08:30 AM	0	2	0	0	0	0	0	0	0	8	0	0	7	0	1	0	18
08:45 AM	0	4	0	0	0	0	0	0	0	7	0	1	13	0	4	0	29
Total	0	11	0	0	0	0	0	0	0	25	0	1	29	0	10	0	76
Grand Total	0	19	0	0	0	0	0	0	0	36	0	3	56	0	21	0	135
Apprch %	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	92.3	0.0	7.7	72.7	0.0	27.3	0.0	
Total %	0.0	14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.7	0.0	2.2	41.5	0.0	15.6	0.0	

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ARTERIAL INTERSECTIONS
Braintree
Washington at Expressway Off-Ramp

File Name : Washington at Route 3 Ramp - AM
Site Code : 06180601
Start Date : 06/18/2009

	Washington St - Northbound						Washington St - Southbound						Route 3 Ramp - Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Intersection	08:00 AM																				
Volume	0	11	0	0	11	0	0	0	0	0	0	25	0	1	26	29	0	10	0	39	76
Percent	0.0	100.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	96.2	0.0	3.8		74.4	0.0	25.6	0.0		
08:45 Volume	0	4	0	0	4	0	0	0	0	0	0	7	0	1	8	13	0	4	0	17	29
Peak Factor																					0.655
High Int.	08:00 AM					6:45:00 AM					08:15 AM					08:45 AM					
Volume	0	4	0	0	4	0	0	0	0	0	0	8	0	0	8	13	0	4	0	17	
Peak Factor					0.688										0.813					0.574	

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ARTERIAL INTERSECTIONS
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Washington at Expressway Off-Ramp

File Name : Washington at Route 3 Ramp - AM
Site Code : 06180601
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Groups Printed- Bikes

	Washington St - Northbound				Washington St - Southbound				Route 3 Ramp - Eastbound								
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total %																	

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ARTERIAL INTERSECTIONS
Braintree
Washington at Expressway Off-Ramp

File Name : Washington at Route 3 Ramp - AM
Site Code : 06180601
Start Date : 06/18/2009

	Washington St - Northbound										Washington St - Southbound					Route 3 Ramp - Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Intersection	07:00 AM																				
Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Percent	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		
07:45 Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Factor																					0.000
High Int. Volume	6:45:00 AM					6:45:00 AM					6:45:00 AM					6:45:00 AM					
Peak Factor																					

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Expressway Off-Ramp

File Name : Washington at Route 3 Ramp - PM
Site Code : 06180602
Start Date : 06/18/2009
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Groups Printed- Cars - Trucks, Buses, & Peds

	Washington St- Northbound								Washington St - Southbound				Route 3 Ramp - Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	0	83	0	0	0	0	0	0	0	67	0	0	171	0	124	0	445
04:15 PM	0	51	0	0	0	0	0	0	0	28	0	0	216	0	158	0	453
04:30 PM	0	11	0	0	0	0	0	0	0	0	0	0	231	0	176	0	418
04:45 PM	0	19	0	1	0	0	0	0	0	7	0	0	236	0	176	0	439
Total	0	164	0	1	0	0	0	0	0	102	0	0	854	0	634	0	1755
05:00 PM	0	20	0	0	0	0	0	0	0	0	0	0	253	0	164	0	437
05:15 PM	0	8	0	0	0	0	0	0	0	0	0	0	248	0	173	0	429
05:30 PM	0	18	0	0	0	0	0	1	0	3	0	0	259	0	166	0	447
05:45 PM	0	0	0	0	0	0	0	0	0	5	0	0	292	0	169	0	466
Total	0	46	0	0	0	0	0	1	0	8	0	0	1052	0	672	0	1779
Grand Total	0	210	0	1	0	0	0	1	0	110	0	0	1906	0	1306	0	3534
Apprch %	0.0	99.5	0.0	0.5	0.0	0.0	0.0	100.0	0.0	100.0	0.0	0.0	59.3	0.0	40.7	0.0	
Total %	0.0	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.0	0.0	53.9	0.0	37.0	0.0	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Expressway Off-Ramp

File Name : Washington at Route 3 Ramp - PM
Site Code : 06180602
Start Date : 06/18/2009

	Washington St- Northbound										Washington St - Southbound					Route 3 Ramp - Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	05:00 PM																				
Volume	0	46	0	0	46	0	0	0	1	1	0	8	0	0	8	1052	0	672	0	1724	1779
Percent	0.0	100.0	0.0	0.0		0.0	0.0	0.0	100.0		0.0	100.0	0.0	0.0		61.0	0.0	39.0	0.0		
05:45 Volume	0	0	0	0	0	0	0	0	0	0	0	5	0	0	5	292	0	169	0	461	466
Peak Factor																					0.954
High Int.	05:00 PM					05:30 PM					05:45 PM					05:45 PM					
Volume	0	20	0	0	20	0	0	0	1	1	0	5	0	0	5	292	0	169	0	461	
Peak Factor					0.575					0.250					0.400					0.935	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Expressway Off-Ramp

File Name : Washington at Route 3 Ramp - PM
Site Code : 06180602
Start Date : 06/18/2009
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Groups Printed- Trucks, Buses, & Peds

	Washington St- Northbound						Washington St - Southbound				Route 3 Ramp - Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	7	0	1	0	8
04:15 PM	0	1	0	0	0	0	0	0	0	0	0	0	6	0	3	0	10
04:30 PM	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2
04:45 PM	0	0	0	1	0	0	0	0	0	0	0	0	2	0	1	0	4
Total	0	2	0	1	0	0	0	0	0	0	0	0	16	0	5	0	24
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	8
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	5	0	1	0	6
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	4	0	2	0	6
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	4	0	3	0	7
Total	0	0	0	0	0	0	0	0	0	0	0	0	17	0	10	0	27
Grand Total	0	2	0	1	0	0	0	0	0	0	0	0	33	0	15	0	51
Apprch %	0.0	66.7	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	68.8	0.0	31.3	0.0	
Total %	0.0	3.9	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	64.7	0.0	29.4	0.0	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Expressway Off-Ramp

File Name : Washington at Route 3 Ramp - PM
Site Code : 06180602
Start Date : 06/18/2009

	Washington St- Northbound										Washington St - Southbound					Route 3 Ramp - Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	05:00 PM																				
Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	10	0	27	27
Percent	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		63.0	0.0	37.0	0.0		
05:00 Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	8	8
Peak Factor																					0.844
High Int.	3:45:00 PM					3:45:00 PM					3:45:00 PM					05:00 PM					
Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	8	
Peak Factor																				0.844	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Expressway Off-Ramp

File Name : Washington at Route 3 Ramp - PM
Site Code : 06180602
Start Date : 06/18/2009
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Groups Printed- Bikes

	Washington St- Northbound								Washington St - Southbound				Route 3 Ramp - Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total %																	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Expressway Off-Ramp

File Name : Washington at Route 3 Ramp - PM
Site Code : 06180602
Start Date : 06/18/2009
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	Washington St- Northbound										Washington St - Southbound					Route 3 Ramp - Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:00 PM																				
Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Percent	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		
04:45 Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Factor																					0.000
High Int. Volume	3:45:00 PM					3:45:00 PM					3:45:00 PM					3:45:00 PM					
Peak Factor																					

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Independence Ave

File Name : Washington at Independence - AM
Site Code : 06160511
Start Date : 06/16/2009
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Groups Printed- Cars - Trucks, Buses & Peds

	Independence SB From North				Washington SW From East				Church St NW From South				Washington NB From West				
Start Time	4	3	2	1	8	7	6	5	12	11	10	9	16	15	14	13	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	0	1	30	73	0	16	112	4	1	189	7	3	82	49	25	40	632
07:15 AM	0	3	35	69	2	23	110	4	2	217	7	0	100	68	32	47	719
07:30 AM	0	1	37	88	3	31	89	8	7	209	6	2	93	75	36	34	719
07:45 AM	0	2	44	79	0	22	104	1	2	219	8	5	92	79	46	30	733
Total	0	7	146	309	5	92	415	17	12	834	28	10	367	271	139	151	2803
08:00 AM	0	4	27	61	2	21	57	3	1	210	4	4	89	76	48	30	637
08:15 AM	2	8	45	87	0	30	114	6	5	165	5	3	85	86	55	35	731
08:30 AM	1	2	66	59	2	29	90	4	1	169	11	3	67	76	48	36	664
08:45 AM	0	4	39	35	0	19	76	3	1	140	13	3	58	93	57	33	574
Total	3	18	177	242	4	99	337	16	8	684	33	13	299	331	208	134	2606
Grand Total	3	25	323	551	9	191	752	33	20	1518	61	23	666	602	347	285	5409
Apprch %	0.3	2.8	35.8	61.1	0.9	19.4	76.3	3.4	1.2	93.6	3.8	1.4	35.1	31.7	18.3	15.0	
Total %	0.1	0.5	6.0	10.2	0.2	3.5	13.9	0.6	0.4	28.1	1.1	0.4	12.3	11.1	6.4	5.3	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Independence Ave

File Name : Washington at Independence - AM
Site Code : 06160511
Start Date : 06/16/2009

	Independence SB From North					Washington SW From East					Church St NW From South					Washington NB From West					
Start Time	4	3	2	1	App. Total	8	7	6	5	App. Total	12	11	10	9	App. Total	16	15	14	13	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Intersection	07:30 AM																				
Volume	2	15	153	315	485	5	104	364	18	491	15	803	23	14	855	359	316	185	129	989	2820
Percent	0.4	3.1	31.5	64.9		1.0	21.2	74.1	3.7		1.8	93.9	2.7	1.6		36.3	32.0	18.7	13.0		
07:45 Volume	0	2	44	79	125	0	22	104	1	127	2	219	8	5	234	92	79	46	30	247	733
Peak Factor																					0.962
High Int.	08:15 AM					08:15 AM					07:45 AM					08:15 AM					
Volume	2	8	45	87	142	0	30	114	6	150	2	219	8	5	234	85	86	55	35	261	
Peak Factor					0.854					0.818					0.913					0.947	

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ARTERIAL INTERSECTIONS
Braintree
Washington at Independence Ave

File Name : Washington at Independence - AM
Site Code : 06160511
Start Date : 06/16/2009
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Groups Printed- Trucks, Buses & Peds

	Independence SB From North				Washington SW From East				Church St NW From South				Washington NB From West				
Start Time	4	3	2	1	8	7	6	5	12	11	10	9	16	15	14	13	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	0	0	1	3	0	2	1	1	0	5	2	0	3	4	1	7	30
07:15 AM	0	1	1	0	0	0	0	0	0	4	1	0	0	3	1	7	18
07:30 AM	0	0	0	4	1	0	1	2	0	6	1	0	0	8	0	7	30
07:45 AM	0	0	2	2	0	1	0	0	0	8	0	0	2	2	1	2	20
Total	0	1	4	9	1	3	2	3	0	23	4	0	5	17	3	23	98
08:00 AM	0	2	0	2	0	2	1	0	1	6	0	0	2	4	1	3	24
08:15 AM	0	2	3	2	0	1	1	1	0	4	0	1	1	2	1	3	22
08:30 AM	0	0	2	1	1	1	1	0	0	5	0	0	2	2	2	7	24
08:45 AM	0	0	4	0	0	0	1	0	0	1	2	0	5	2	0	7	22
Total	0	4	9	5	1	4	4	1	1	16	2	1	10	10	4	20	92
Grand Total	0	5	13	14	2	7	6	4	1	39	6	1	15	27	7	43	190
Apprch %	0.0	15.6	40.6	43.8	10.5	36.8	31.6	21.1	2.1	83.0	12.8	2.1	16.3	29.3	7.6	46.7	
Total %	0.0	2.6	6.8	7.4	1.1	3.7	3.2	2.1	0.5	20.5	3.2	0.5	7.9	14.2	3.7	22.6	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Independence Ave

File Name : Washington at Independence - AM
Site Code : 06160511
Start Date : 06/16/2009

	Independence SB From North					Washington SW From East					Church St NW From South					Washington NB From West					
Start Time	4	3	2	1	App. Total	8	7	6	5	App. Total	12	11	10	9	App. Total	16	15	14	13	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Intersection	07:00 AM																				
Volume	0	1	4	9	14	1	3	2	3	9	0	23	4	0	27	5	17	3	23	48	98
Percent	0.0	7.1	28.6	64.3		11.1	33.3	22.2	33.3		0.0	85.2	14.8	0.0		10.4	35.4	6.3	47.9		
07:30 Volume	0	0	0	4	4	1	0	1	2	4	0	6	1	0	7	0	8	0	7	15	30
Peak Factor																					0.817
High Int.	07:00 AM					07:00 AM					07:45 AM					07:00 AM					
Volume	0	0	1	3	4	0	2	1	1	4	0	8	0	0	8	3	4	1	7	15	
Peak Factor					0.875					0.563					0.844					0.800	

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ARTERIAL INTERSECTIONS
Braintree
Washington at Independence Ave

File Name : Washington at Independence - AM
Site Code : 06160511
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Groups Printed- Bikes

	Independence SB From North				Washington SW From East				Church St NW From South				Washington NB From West				
Start Time	4	3	2	1	8	7	6	5	12	11	10	9	16	15	14	13	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	3
Grand Total	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	0	4
Apprch %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	100.0	0.0	0.0	
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	75.0	0.0	25.0	0.0	0.0	

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ARTERIAL INTERSECTIONS
Braintree
Washington at Independence Ave

File Name : Washington at Independence - AM
Site Code : 06160511
Start Date : 06/16/2009

	Independence SB From North					Washington SW From East					Church St NW From South					Washington NB From West					
Start Time	4	3	2	1	App. Total	8	7	6	5	App. Total	12	11	10	9	App. Total	16	15	14	13	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Intersection	07:45 AM																				
Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	1	0	0	1	3
Percent	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0	100.0		0.0	100.0	0.0	0.0		
08:30 Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	2
Peak Factor																					0.375
High Int.	6:45:00 AM					6:45:00 AM					08:00 AM					08:30 AM					
Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	
Peak Factor															0.500					0.250	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Independence Ave

File Name : Washington at Independence - PM
Site Code : 06160522
Start Date : 06/16/2009
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Groups Printed- Cars - Trucks, Buses, and Peds

	Independence SB Southbound				Washington SW Westbound				Church St NW Northbound				Washington NB Westbound				
Start Time	4	3	2	1	8	7	6	5	12	11	10	9	16	15	14	13	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	2	8	51	39	2	28	45	4	4	70	8	4	50	70	111	136	632
04:15 PM	1	18	51	46	0	24	64	3	3	59	3	3	51	80	124	115	645
04:30 PM	2	20	91	46	0	27	30	1	4	50	4	1	56	83	133	126	674
04:45 PM	1	11	60	27	0	33	36	0	2	83	2	3	53	88	140	147	686
Total	6	57	253	158	2	112	175	8	13	262	17	11	210	321	508	524	2637
05:00 PM	0	12	59	50	0	36	41	1	7	64	11	5	71	81	127	158	723
05:15 PM	1	16	74	42	1	31	51	4	3	86	3	1	42	81	158	144	738
05:30 PM	0	15	71	40	0	26	37	1	4	55	11	2	54	89	163	142	710
05:45 PM	0	15	81	46	3	29	24	0	4	60	3	3	62	103	151	167	751
Total	1	58	285	178	4	122	153	6	18	265	28	11	229	354	599	611	2922
Grand Total	7	115	538	336	6	234	328	14	31	527	45	22	439	675	1107	1135	5559
Apprch %	0.7	11.5	54.0	33.7	1.0	40.2	56.4	2.4	5.0	84.3	7.2	3.5	13.1	20.1	33.0	33.8	
Total %	0.1	2.1	9.7	6.0	0.1	4.2	5.9	0.3	0.6	9.5	0.8	0.4	7.9	12.1	19.9	20.4	

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ARTERIAL INTERSECTIONS
Braintree
Washington at Independence Ave

File Name : Washington at Independence - PM
Site Code : 06160522
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	Independence SB Southbound					Washington SW Westbound					Church St NW Northbound					Washington NB Westbound					
Start Time	4	3	2	1	App. Total	8	7	6	5	App. Total	12	11	10	9	App. Total	16	15	14	13	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	05:00 PM																				
Volume	1	58	285	178	522	4	122	153	6	285	18	265	28	11	322	229	354	599	611	1793	2922
Percent	0.2	11.1	54.6	34.1		1.4	42.8	53.7	2.1		5.6	82.3	8.7	3.4		12.8	19.7	33.4	34.1		
05:45 Volume	0	15	81	46	142	3	29	24	0	56	4	60	3	3	70	62	103	151	167	483	751
Peak Factor																					0.973
High Int.	05:45 PM					05:15 PM					05:15 PM					05:45 PM					
Volume	0	15	81	46	142	1	31	51	4	87	3	86	3	1	93	62	103	151	167	483	
Peak Factor					0.919					0.819					0.866					0.928	

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ARTERIAL INTERSECTIONS
Braintree
Washington at Independence Ave

File Name : Washington at Independence - AM
Site Code : 06160511
Start Date : 06/16/2009
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Groups Printed- Trucks, Buses & Peds

	Independence SB From North				Washington SW From East				Church St NW From South				Washington NB From West				
Start Time	4	3	2	1	8	7	6	5	12	11	10	9	16	15	14	13	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	0	0	1	3	0	2	1	1	0	5	2	0	3	4	1	7	30
07:15 AM	0	1	1	0	0	0	0	0	0	4	1	0	0	3	1	7	18
07:30 AM	0	0	0	4	1	0	1	2	0	6	1	0	0	8	0	7	30
07:45 AM	0	0	2	2	0	1	0	0	0	8	0	0	2	2	1	2	20
Total	0	1	4	9	1	3	2	3	0	23	4	0	5	17	3	23	98
08:00 AM	0	2	0	2	0	2	1	0	1	6	0	0	2	4	1	3	24
08:15 AM	0	2	3	2	0	1	1	1	0	4	0	1	1	2	1	3	22
08:30 AM	0	0	2	1	1	1	1	0	0	5	0	0	2	2	2	7	24
08:45 AM	0	0	4	0	0	0	1	0	0	1	2	0	5	2	0	7	22
Total	0	4	9	5	1	4	4	1	1	16	2	1	10	10	4	20	92
Grand Total	0	5	13	14	2	7	6	4	1	39	6	1	15	27	7	43	190
Apprch %	0.0	15.6	40.6	43.8	10.5	36.8	31.6	21.1	2.1	83.0	12.8	2.1	16.3	29.3	7.6	46.7	
Total %	0.0	2.6	6.8	7.4	1.1	3.7	3.2	2.1	0.5	20.5	3.2	0.5	7.9	14.2	3.7	22.6	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Independence Ave

File Name : Washington at Independence - AM
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	Independence SB From North					Washington SW From East					Church St NW From South					Washington NB From West					
Start Time	4	3	2	1	App. Total	8	7	6	5	App. Total	12	11	10	9	App. Total	16	15	14	13	App. Total	Int. Total
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Intersection	07:00 AM																				
Volume	0	1	4	9	14	1	3	2	3	9	0	23	4	0	27	5	17	3	23	48	98
Percent	0.0	7.1	28.6	64.3		11.1	33.3	22.2	33.3		0.0	85.2	14.8	0.0		10.4	35.4	6.3	47.9		
07:30 Volume	0	0	0	4	4	1	0	1	2	4	0	6	1	0	7	0	8	0	7	15	30
Peak Factor																					0.817
High Int.	07:00 AM					07:00 AM					07:45 AM					07:00 AM					
Volume	0	0	1	3	4	0	2	1	1	4	0	8	0	0	8	3	4	1	7	15	
Peak Factor					0.875					0.563					0.844					0.800	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Independence Ave

File Name : Washington at Independence - PM
Site Code : 06160522
Start Date : 06/16/2009
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Groups Printed- Bikes

	Independence SB Southbound				Washington SW Westbound				Church St NW Northbound				Washington NB Westbound				
Start Time	4	3	2	1	8	7	6	5	12	11	10	9	16	15	14	13	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
05:00 PM	0	0	0	0	0	0	0	0	0	1	0	3	0	0	0	0	4
05:15 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
Total	0	0	0	0	0	0	0	0	0	3	0	6	0	0	0	0	9
Grand Total	0	0	0	0	0	0	0	0	0	3	0	7	0	0	0	0	10
Apprch %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0	0.0	70.0	0.0	0.0	0.0	0.0	
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0	0.0	70.0	0.0	0.0	0.0	0.0	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Independence Ave

File Name : Washington at Independence - PM
Site Code : 06160522
Start Date : 06/16/2009
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	Independence SB Southbound					Washington SW Westbound					Church St NW Northbound					Washington NB Westbound					
Start Time	4	3	2	1	App. Total	8	7	6	5	App. Total	12	11	10	9	App. Total	16	15	14	13	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	05:00 PM																				
Volume	0	0	0	0	0	0	0	0	0	0	0	3	0	6	9	0	0	0	0	0	9
Percent	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	33.3	0.0	66.7		0.0	0.0	0.0	0.0		
05:00 Volume	0	0	0	0	0	0	0	0	0	0	0	1	0	3	4	0	0	0	0	0	4
Peak Factor																					0.563
High Int.	3:45:00 PM					3:45:00 PM					05:00 PM					3:45:00 PM					
Volume	0	0	0	0	0	0	0	0	0	0	0	1	0	3	4						
Peak Factor															0.563						

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Independence Ave

File Name : Washington at Independence - PM
Site Code : 06160522
Start Date : 06/16/2009
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Groups Printed- Trucks, Buses, and Peds

	Independence SB Southbound				Washington SW Westbound				Church St NW Northbound				Washington NB Westbound				
Start Time	4	3	2	1	8	7	6	5	12	11	10	9	16	15	14	13	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	7	11
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	3	2	1	3	9
04:30 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	8	11
04:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	1	2	1	8	14
Total	0	0	0	0	0	0	0	0	0	6	0	1	4	5	3	26	45
05:00 PM	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2	4
05:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	2	1	0	5	9
05:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	2	5
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	4
Total	0	0	0	0	0	0	0	0	0	3	1	0	2	4	0	12	22
Grand Total	0	0	0	0	0	0	0	0	0	9	1	1	6	9	3	38	67
Apprch %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.8	9.1	9.1	10.7	16.1	5.4	67.9	
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.4	1.5	1.5	9.0	13.4	4.5	56.7	

CTPS
ARTERIAL INTERSECTIONS
Braintree
Washington at Independence Ave

File Name : Washington at Independence - PM
Site Code : 06160522
Start Date : 06/16/2009

	Independence SB Southbound					Washington SW Westbound					Church St NW Northbound					Washington NB Westbound					
Start Time	4	3	2	1	App. Total	8	7	6	5	App. Total	12	11	10	9	App. Total	16	15	14	13	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection 04:00 PM																					
Volume	0	0	0	0	0	0	0	0	0	0	0	6	0	1	7	4	5	3	26	38	45
Percent	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	85.7	0.0	14.3		10.5	13.2	7.9	68.4		
04:45 Volume	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	1	2	1	8	12	14
Peak Factor																					0.804
High Int.	3:45:00 PM					3:45:00 PM					04:00 PM					04:45 PM					
Volume	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	1	2	1	8	12	
Peak Factor															0.583					0.792	

Appendix D

MassDOT Intersection Crash Rate Worksheets

Moving Massachusetts Forward. massDOT Highway

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Braintree COUNT DATE : 6/16/2009

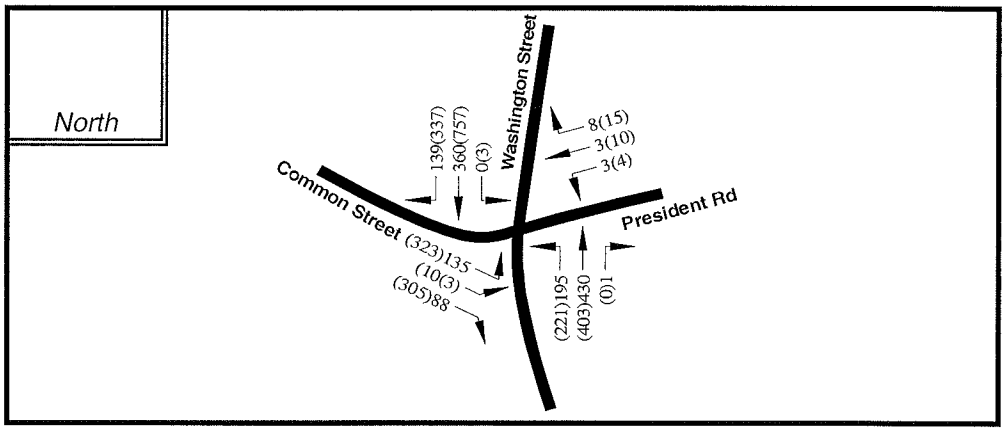
DISTRICT : 4 UNSIGNALIZED : [ ] SIGNALIZED : [X]

~ INTERSECTION DATA ~

MAJOR STREET : Washington Street

MINOR STREET(S) : Ramp E

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (AM/PM)	624	1,097	638	29		2,388

" K " FACTOR : 0.090

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : 26,533

TOTAL # OF CRASHES : 12

OF YEARS : 3

AVERAGE # OF CRASHES PER YEAR (**A**) : 4.00

CRASH RATE CALCULATION : 0.41

RATE = (A * 1,000,000) / (V * 365)

Comments : District 4 Average = 0.78

Project Title & Date: Arterial Intersections

Moving Massachusetts Forward. massDOT Highway

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Braintree COUNT DA 6/16/2009

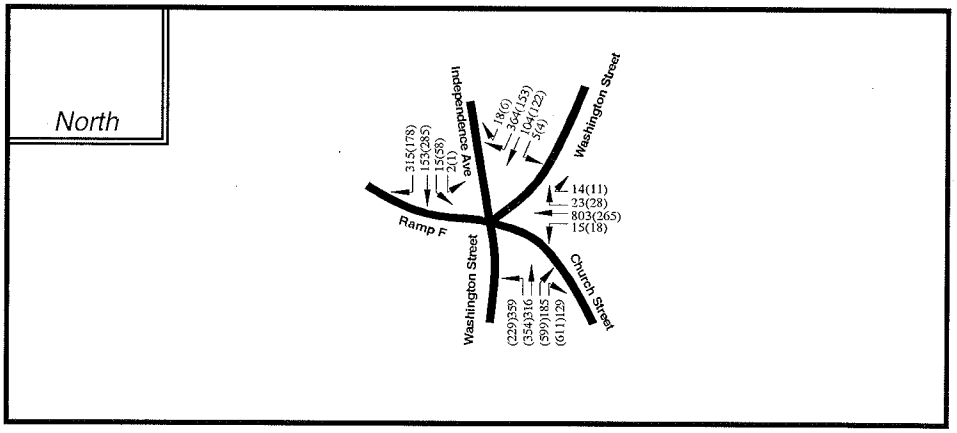
DISTRICT : 4 UNSIGNALIZED : SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Washington Street

MINOR STREET(S) : Independence Ave./Church Street/Ramp F

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	WB	SW		
PEAK HOURLY VOLUMES (AM/PM)	1,793	522	322	285		2,922

" K " FACTOR : 0.090

INTERSECTION ADT (V) = TOTAL DAILY APPROACH VOLUME : 32,467

TOTAL # OF CRASHES : 14

OF YEARS : 3

AVERAGE # OF CRASHES PER YEAR (A) : 4.67

CRASH RATE CALCULATION : 0.39

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : District 4 Average = 0.78

Project Title & Date: Arterial Intersections

Moving Massachusetts Forward. massDOT Highway

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Braintree COUNT DA 6/16/2009

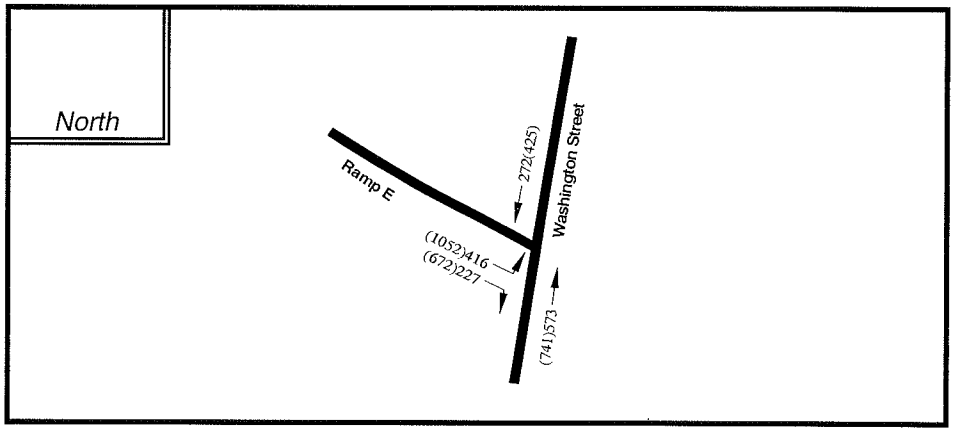
DISTRICT : 4 UNSIGNALIZED : SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Washington Street

MINOR STREET(S) : Ramp E

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB			
PEAK HOURLY VOLUMES (AM/PM)	741	425	1,724			2,890

" K " FACTOR : 0.090

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : 32,111

TOTAL # OF CRASHES : 22

OF YEARS : 3

AVERAGE # OF CRASHES PER YEAR (**A**) : 7.33

CRASH RATE CALCULATION : 0.63

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : District 4 Average = 0.78

Project Title & Date: Arterial Intersections